TABLE 2.—*Vapor pressures at pyrheliometric stations on days when solar radiation intensities were measured.*

Washington, D. C.			Madison, Wis.			Lincoln, Nebr.			Santa Fe, N. Mex.		
Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.
1918.	*mm.*	*mm.*	1918.	*mm.*	*mm.*	1918.	*mm.*	*mm.*	1918.	*mm.*	*mm.*
Apr. 2	9.83	8.48	Apr. 2	3.63	4.75	Apr. 1	2.74	4.75	Apr. 2	3.00	2.16
5	2.26	2.62	3	2.62	2.62	7	4.17	2.62	4	3.00	3.15
6	3.00	3.63	4	2.74	2.49	8	1.88	2.62	8	4.17	4.37
14	4.57	4.75	10	2.16	2.49	9	1.96	2.49	9	3.15	2.87
15	4.75	5.16	12	4.37	2.49	16	5.16	5.79	19	2.26	4.37
16	7.04	10.21	13	2.36	2.74	18	4.17	4.57	21	2.87	2.49
17	10.97	14.10	23	3.00	3.00	28	4.57	3.81	22	2.36	2.62
19	6.50	9.47	.....	.....	.....	30	4.57	3.45	.....	.....	.....
22	7.04	5.56	.....	.....	.....	.....	.....	.....	.....	.....	.....
23	8.18	10.59	.....	.....	.....	.....	.....	.....	.....	.....	.....
24	4.17	5.56	.....	.....	.....	.....	.....	.....	.....	.....	.....
25	5.36	4.75	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 3.—*Daily totals and departures of solar and sky radiation during April, 1918.*

[Gram-calories per square centimeter of horizontal surface.]

Day of month.	Daily totals.			Departures from normal.			Excess or deficiency since first of month.		
	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.
1918.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Apr. 1	380	524	542	−1	135	118	−1	135	118
2	473	371	233	90	−20	−182	89	115	−64
3	177	510	180	−208	117	−246	−119	232	−310
4	205	558	552	−183	163	124	−302	395	−186
5	634	511	120	243	114	−310	−59	509	−496
6	574	102	536	182	−297	105	123	212	−391
7	194	196	521	−200	−204	89	−77	8	−302
8	184	631	640	−212	229	207	−289	237	−95
9	44	606	638	−354	203	204	−643	440	109
10	75	643	596	−325	238	161	−968	678	270
11	41	444	643	−361	38	207	−1,329	716	477
12	206	575	559	−198	167	122	−1,527	883	599
13	267	571	563	−139	162	125	−1,666	1,045	724
14	615	516	236	207	105	−203	−1,459	1,150	521
15	568	416	261	158	3	−179	−1,301	1,153	342
16	406	306	572	−6	−110	131	−1,307	1,043	473
17	390	93	552	−24	−326	109	−1,331	717	582
18	311	183	456	−107	−239	11	−1,438	478	593
19	470	518	95	47	93	−351	−1,391	571	242
20	112	153	243	−315	−275	−204	−1,706	296	38
Decade departure							−738	−382	−232
21	281	78	390	−150	−353	−58	−1,856	−57	−20
22	442	566	478	6	132	28	−1,850	75	8
23	561	558	418	120	121	−34	−1,730	196	−26
24	585	611	432	140	171	−22	−1,590	367	−58
25	626	464	648	177	21	184	−1,413	388	125
26	383	398	249	−69	−47	−207	−1,482	341	−82
27	534	190	82	79	−256	−375	−1,403	85	−457
28	601	129	488	142	−319	30	−1,261	−234	−427
29	339	203	625	−123	−246	165	−1,384	−480	−262
30	338	259	684	−128	−192	223	−1,512	−672	−29
Decade departure							+194	−968	−67
Excess or deficiency since first of year. (calories							−995	+865	−579
Excess or deficiency since first of year. (per cent							−2.8	+2.4	−1.4

ABSORPTION AND RADIATION OF THE SOLAR ATMOSPHERE.

By SHIN HIRAYAMA.

[*Abstract reprinted from* Nature, London, Apr. 18, 1918, 101:134.]

A paper by Prof. Shin Hirayama appears under this title in the Proceedings of the Tokyo Mathematico-Physical Society, second series, volume 9, page 236. Utilizing observations of the radiation from different parts of the solar disk which have been made by Abbot, Prof. Hirayama computes the transmission and radiation of the solar atmosphere, on Schuster's supposition that a great part of the solar radiation comes from an absorbing and radiating layer above the photosphere. It is shown that the observations are better represented in this way than by the previous calculations of Biscoe, in which the radiation of the atmosphere was not considered. The coefficient of transmission increases gradually with the wave-length, and the radiation due to the atmosphere ranges from one-third of the whole radiation for the shorter wave-lengths to nearly one-half as the wave-length increases. Assuming the effective temperature of the sun to be 6,000° Abs., it is calculated that the temperature of the photosphere is about 7,040°, while that of the absorbing layer is 5,210°

HALO OF APRIL 14, 1918, AT COLUMBUS, OHIO.[1]

By HOWARD H. MARTIN, Observer.

[Dated: Weather Bureau, Columbus, Ohio, April 19, 1918.]

A very complex and highly colored solar halo with four attendant parhelia and a vividly colored circumzenithal arc was observed at this station (lat. 39° 58′ N.; long. 83° 0′ W.) from 4:50 p. m. to 5:40 p. m., *Normal* 90th Meridian Time.

The accompanying drawing, figure 1, depicts the phenomenon as it appeared at the moment of greatest color and distinctness, viz, 5:12 p. m. The circumzenithal arc was visible from the moment of first appearance (4:50 p. m.) to about 5:02 p. m., and again from 5:08 p. m. to 5:15 p. m. Probably the most highly colored and brilliant of the four parhelia was that one observed at the junction of the upper bitangent arc of the 46°-halo and the circumzenithal arc. At the time of greatest intensity there was a faint coloring about the zenith, suggesting the presence of Kern's Arc, but the coloring faded without a well-defined appearance.

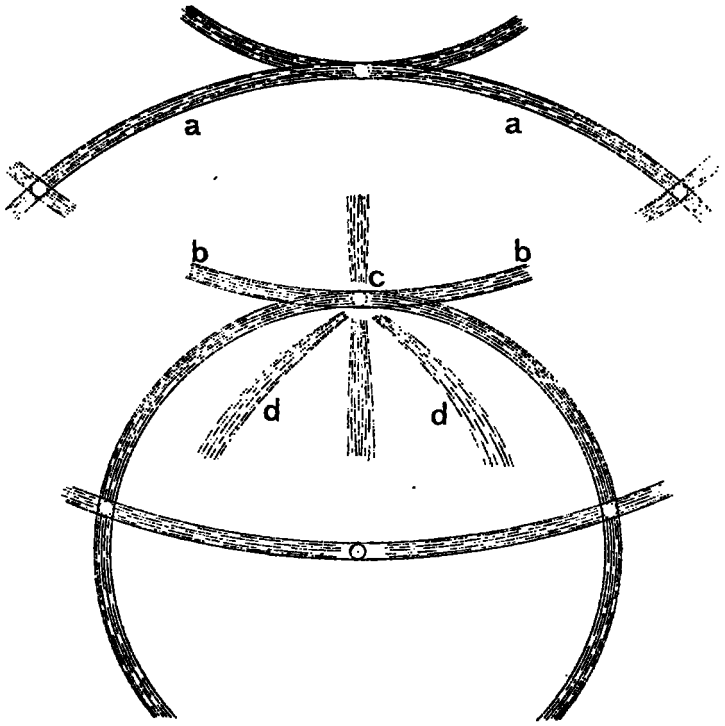

FIG. 1.—Solar halos observed at Columbus, Ohio, Apr. 14, 1918 (5:12 p. m. 90th M. T.).

A light pillar extended upward from the sun for a very short period of time subsequent to 5:10 p. m., and at the same time faint fragments of upper arcs of circumscribing halos were visible.

The halo occurred after a day of fine weather. A sudden movement of cirro-stratus from the southwest occurred between 3:30 p. m. and 6 p. m., with a stationary barometer and a temperature of 64°. The cloudiness passed as quickly as it came and the phenomenon was followed by no immediate weather change of note, although precipitation occurred during the subsequent 36 hours.

NOTE.

In the sketch, figure 1, furnished by Mr. Martin, there are indicated two very unusual forms, and in addition one

[1] Publication approved by Division of Aërological Investigations.

that does not seem to have been heretofore observed. The first two are those marked *aa* and *bb*, which apparently are the upper bitangent arc of a halo of 46° and part of a "secondary" parhelic circle, respectively. At the intersections of these two arcs were observed bright spots which might be called "secondary" parhelia of 46°. The "secondary" parhelic circle was probably caused by the vertical parhelion at *c*, which in turn was produced by the intersection of the light pillar and the 22° halo.

The arcs *dd* are difficult to account for. Possibly they are parts of an "eliptical helio-centric halo," similar to that observed by Hissink in 1901, and referred to by Besson, MONTHLY WEATHER REVIEW, July, 1914, p. 445, top of column 1.—*W. R. Gregg.*

INFERIOR ARC OF 46°-HALO, APRIL 25, 1918.[1]

By J. LAKE VESPER, Assistant Observer.

[Dated: Weather Bureau Office, Columbus, Ohio, May 20, 1918.]

A very interesting and unusual[2] optical phenomenon in the form of a double solar halo was observed at this station, Columbus, Ohio, on April 25, 1918.

When first noted at 11:50 a. m., 90th meridian summer time [?], it was exceedingly well defined and evidently had been visible for some time previous. Its duration for attractive brilliancy lasted until 12:40 p. m., after which it gradually faded.

The time of day at which it occurred (the sun being almost at its maximum elevation in the sky) was most advantageous for the observation of the complete 22°-halo. It was accompanied by the *lower arc* of a 46°-halo, the arc measuring approximately 50° in extent. The brilliancy of the 22°-halo was well defined for the 360°, with the exception of the lower segment symmetrical with the arc of the 46°-halo. This segment had attained a very great brilliancy, causing the arc of the 46°-halo to be visible.

The latter lacked somewhat the brilliancy of the 22°-halo, but the color was well defined, with the blue predominating.

A double solar halo observed at this station by Mr. T. G. Shipman, August 1, 1911, at 12:10 p. m. [90th mer. time], was similar, the radius of the outer halo being 46° and the inner 22°. Its coloring was very marked and beautiful.

Dr. Louis Besson, in his article, "The Different Forms of Halos and Their Observation" (this REVIEW, July, 1914, 42 : 438–9), states that the average frequency of such phenomena at Paris is eight days per annum, and in two-thirds of the cases only the superior portion of the 46°-halo is visible. This case of the lower arc is therefore a rare one and worth recording here.

ELLIPTICAL HALOS OF VERTICAL MAJOR AXIS.

By J. B. DALE.

(Craigness, New Malden, Surrey, Apr. 10, 1918.)

[*Reprinted from* Nature, London, Apr. 18, 1918, 101 : 126.]

The accepted explanation of the halos of 22° radius which are seen surrounding the sun and moon implies that they are exactly circular in form. About two years ago, however, I noticed a halo which appeared to be elliptical with the major axis vertical. I was unfortunately unable to take any measurements on that occasion, but on March 18, 1918, a lunar halo, which was visible for a considerable time during the evening, also appeared to possess a decided, though slight ellipticity. That this deviation from the circular form was not an illusion I was enabled to verify by noting the positions of Capella and γ Geminorum relative to the ring.

At 7:30 p. m. Capella appeared to be exactly upon the inner edge of the halo, while γ Geminorum was within the ring at a distance from it, which, as nearly as I could judge, was a quarter of the moon's diameter. From these data I find that the radii of the halo measured from the centroid of the illuminated disk of the moon through these two stars were 22.8° and 21.4°, respectively. Assuming that the halo was elliptical with the major axis vertical, I deduce values of 23.3° and 21.4° for the semi-major and semiminor axes. I am aware that a more or less complete halo, the major axis of which is horizontal, is occasionally seen surrounding the 22°-halo, but records of halos elongated vertically are rare. In 1908 Prof. Schlesinger noticed one, the axes of which were about 7° and 4°.

Sir Napier Shaw informs me that very little is done in this country on the shapes of halos, so that this letter may serve to direct attention to the desirability of obtaining accurate measurements.

REAL VELOCITIES OF METEORS.[3]

By CHARLES P. OLIVIER.

[*Reprinted from* Science Abstracts, Sect. A, Jan. 31, 1918, § 29.]

From a list of real flights of meteors observed by members of the British Astronomical Association (B. A. A. Journal, January, 1917), eight doubly-observed meteors are selected as assigned to a radiant near R. A. = 302°, Decl. −8°. This position is not far from the ecliptic, and appears to be a very likely example of a stationary radiant. To investigate the orbits reductions were made by Bauschinger's method, and the results are presented in a table showing the elements for each meteor orbit. Some difficulty is introduced by the importance of the duration of the time of flight, the observation of which is scarcely accurate enough when made visually, and it is hoped that systematic work may soon be done with photographic registration, apparatus having been designed for this purpose by the late Cleveland Abbe. It is concluded that the radiant under discussion is the most promising of all those hitherto examined with regard to its likelihood of being a stationary radiant.—*C. P. B[utler].*

VISIBLE WEATHER [CHINOOK WEATHER ?].

The following interesting communication, by Robert T. Pound, is reprinted from Scientific American, New York, February 16, 1918, page 147:

LAVINA, FERGUS COUNTY, MONT.
[Lat. 46° 12′ N., long. 109° W.]

On December 14 [1917], after several days of storm, my brother and I noticed that the western end of the Big Snowy Mountains, about 20 miles northwest of our place, seemed strangely distorted, the distor-

[1] Publication approved by Division of Aërological Investigations.

[2] The 46°-halo or its upper arc is not so very rare in this country. The REVIEW for July, 1914, pp. 431–436, presents in its figures 1, 3, 5, and 8, illustrations of 46°-halo seen in November, 1913; cases of the 46°-halo are also reported in the REVIEW for October, 1917, p. 486, and for May, 1915, p. 215.—C. A., Jr.

[3] The Observatory, October, 1917, No. 518, p. 365–368.